

June 14, 2001

MEMORANDUM TO: C. William Reamer, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

FROM: William L. Belke, Sr. On-Site Licensing Representative
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Office of Nuclear Material Safety and Safeguards

SUBJECT: U. S. NUCLEAR REGULATORY COMMISSION ON-SITE LICENSING
REPRESENTATIVES' REPORT ON YUCCA MOUNTAIN PROJECT
FOR MARCH 1, 2001 THROUGH APRIL 30, 2001

The purpose of this letter is to transmit the U.S. Nuclear Regulatory Commission (NRC) On-Site Representative's (OR's) report for the period of March 1, 2001, through April 30, 2001.

This report highlights a number of Yucca Mountain Project activities of potential interest to NRC staff. The OR's continue to respond to requests from NRC Headquarters staff to provide various documentation and feedback related to Key Technical Issues (KTIs) and their resolution. During this reporting period, the OR's continued to observe activities associated with Yucca Mountain Site Characterization, KTIs, and auditing. The OR's also attended a number of meetings and accompanied NRC staff on visits to Yucca Mountain.

If you have any questions on this report or its enclosures, please call William L. Belke on (702) 794-5047, Chad J. Glenn on (702) 794-5046 or Robert Latta on (702) 794-5048.

Enclosures: U.S. Nuclear Regulatory Commission On-Site Licensing Representatives Report
ESF/ECRB Plan View Alcove, Niche and Borehole Test Locations
Niche 5 "Batwing" General Layout - Test Excavation
Nye County Early Warning Drilling Program Drillhole Locations
Picture of Trench Cut with ponded water in Alcove 8

Distribution list for Memorandum to C. William Reamer dated: June 14, 2001

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March 1, 2001 through April 30, 2001

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U. S. NUCLEAR REGULATORY COMMISSION
ON-SITE LICENSING REPRESENTATIVES REPORT
NUMBER OR-02-01

FOR THE REPORTING PERIOD OF MARCH 1, 2001 THROUGH APRIL 30, 2001

/s/

William L. Belke
Sr. On-Site Licensing Representative
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High-Level Waste Branch
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Reviewed and approved by:

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~~Dave Brooks~~
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Enclosures

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ON-SITE LICENSING REPRESENTATIVE REPORT
NUMBER OR-02-01

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1.0 EXECUTIVE SUMMARY

DEFICIENCIES DATA BASE

The On-Site Representative's (OR) review of the data base used for tracking deficiencies adverse to quality revealed that there may be areas where there are repetitive recurrences of deficiencies previously identified and closed.

The data base identified six examples where suppliers failed to include applicable quality and technical requirements into supplier generated procurement documents. This concern was originally identified as a U.S. Nuclear Regulatory Commission (NRC) Open Item in the August/September 1999 OR Report, and subsequently closed in the September/October 2000 OR Report. The U.S. Department of Energy (DOE) is presently evaluating this area for further potential trend investigation relative to suppliers fully understanding the incorporation of applicable quality and technical requirements into procurement documents.

The other area of a suspected trend was the recurrence of scientific notebook (S/N) deficiencies. These increased deficiencies also prompted DOE to issue a Suspected Trend Investigation Report (STIR). Increased S/N deficiencies were noted as an NRC OR Open Item in the January/February 1998 OR Report and closed in the October/November 1999 OR Report. The STIR resulted in a DOE surveillance which concluded that Bechtel SAIC Company, LLC (BSC) is proactive in the control of S/Ns and that no adverse quality trend exists. The review did not indicate there was a significant condition adverse to quality. The OR will monitor this matter through future DOE audits and surveillances to determine whether a trend exists.

AUDIT/OBSERVATION OF DESIGN CONTROL PROGRAM

During the week of April 23-27, 2001, the OR's observed the DOE's compliance-based audit of the Office of Civilian Radioactive Waste Management (OCRWM) and Management System Management and Operating Contractor's (M&O's) implementation of selected sections of the Quality Assurance Requirements and Description (QARD), including those elements related to Design Control. Within the areas examined, the audit team concluded that the Quality Assurance program had been satisfactorily implemented. However, one potential deficiency was identified concerning the failure to follow the requirements of Administrative Procedure AP-5.1Q, "Plan and Procedure Preparation, Review, and Approval", which prohibits the use of procedural "notes" to convey action requirements. The OR's reviewed the audit team's findings and agreed with the results as presented at the post audit conference.

EXPLORATORY STUDIES FACILITY (ESF) & NRC KEY TECHNICAL ISSUES (KTIs)

Seepage Testing

DOE is conducting water release and seepage testing at several locations in the Topopah Spring Tuff. Passive hydrologic testing continues where sealed bulkheads isolate sections of the Enhanced Characterization of the Repository Block (ECRB) from the effects of ventilation to allow drifts to return to ambient conditions in an effort to

observe natural seepage. DOE expects to complete a detailed plan for the passive hydrologic test by August 2001.

CI-36 Validation Study

Testing to verify the presence of bomb pulse chlorine-36 in the vicinity of the Sundance and Drill Hole Wash Faults continues. DOE reports that preliminary tritium and chlorine-36 analyses completed, to date, have not confirmed the presence of bomb pulse chlorine-36; however, additional analyses await completion. DOE is proceeding with steps to determine if differences in sample preparation techniques might explain differences in analytical results from two laboratories. Two laboratories completed separate leaching experiments of reference samples to determine what effect different leaching procedures may have on chlorine-36 analyses. According to DOE, preliminary results of these experiments suggest that the manner in which chlorine is leached from rock samples impacts the ratio of chlorine-36 to chlorine. The laboratories plan to complete chlorine-36 analyses on these samples, compare results, and develop a standard protocol for analyzing the remaining samples for this study.

Thermal Testing

DOE continues to maintain drift wall-rock temperatures at or below 200° Centigrade in the Alcove 5 thermal test. Over this period, DOE issued Thermal Test Progress Report #6 in April 2001. DOE reported evidence of rock spalling at several locations in the Alcove 5 Heated Drift. DOE is presently evaluating the nature and cause of this condition. DOE continues to drill boreholes in the Topopah Spring lower lithophysal unit to collect in-situ thermal conductivity data of this rock unit. The next DOE sponsored Thermal Test Workshop is scheduled for June 7-8 in Las Vegas.

Fluid Inclusion Study

University of Nevada Las Vegas (UNLV) scientists have completed a study to determine the origin and age of fluid inclusions in calcite at Yucca Mountain. In May 2001, UNLV scientists plan to submit a final report on this study to DOE.

Surface-Based Testing

DOE completed the field work supporting a geotechnical investigation at the Yucca Mountain North Portal area to collect rock property and geophysical data for input to the design of a waste handling building for a potential repository at Yucca Mountain. A final report is expected to be submitted to DOE by the end of FY 2001.

Nye County Early Warning Drilling Program

Over this period, DOE completed their third and final single well alluvial tracer test at Nye County well NC-EWDP-19D/D1. A final report is expected to be submitted by DOE by late summer 2001.

Busted Butte Unsaturated Zone Transport Test Facility

Phase II post-test characterization continued over this period. Atomic Energy of Canada, LTD., continues radionuclide tracer testing on blocks of tuff extracted from the Busted Butte Test Facility.

Engineered Barrier System (EBS) Testing

DOE continues EBS testing at their Pilot Scale Test Facility located in North Las Vegas. The DOE Phase II pre-closure ventilation test started in April 2001. This phase of testing simulates the ability of ventilation inlet air, at different temperatures, to maintain sub-boiling temperature at the emplacement drift wall in a potential repository.

REPORT DETAILS

2.0 INTRODUCTION

The principal purpose of the OR report is to inform NRC staff, managers, and contractor's of information on the DOE programs for site characterization, repository design, performance assessment, and environmental studies that may be of use in fulfilling NRC's role during pre-licensing consultation. The principal focus of this and future OR reports will be on DOE's programs for the ESF, surface-based testing, performance assessment, data management systems, and environmental studies. Relevant information includes new technical data, DOE's plans and schedules, and the status of activities to pursue site suitability. The OR's also participate in activities associated with resolving NRC Key Technical Issues (KTIs). In addition to communication of this information, this report may raise potential licensing concerns, or express opinions; these items represent the views of the OR's. The reporting period for this report covers March 1, 2001 through April 30, 2001.

3.0 OBJECTIVES

The OR mission is to principally serve as a point of prompt informational exchange and consultation and to preliminarily identify concerns about site investigations relating to potential licensing issues. The OR's accomplish this function by communicating, consulting and identifying concerns. Communication is accomplished by exchanging information on data, plans, schedules, documents, activities and pending actions, and resolution of issues. The OR's consult with DOE scientists, engineers, and managers with input from NRC Headquarters management on NRC policy, philosophy, and regulations. The OR's focus on such issues as Quality Assurance (QA), design controls, data management systems, performance assessment, and KTIs resolution. A principal OR role is to identify areas in site characterization and related studies, activities, or procedures that may be of interest or concern to the NRC staff.

4.0 QUALITY ASSURANCE, ENGINEERING AND NRC KEY TECHNICAL ISSUES

AUDIT/OBSERVATION OF M&O PROCUREMENT PROGRAM

Background

During this reporting period the OR's observed selected aspects of the DOE's, OCRWM, Office of Quality Assurance (OQA), audit of the implementation adequacy and supporting documentation associated with the OCRWM QA Program. This audit, BSC-ARC-01-06, was conducted on April 23-27, 2001, at the OCRWM M&O facilities in Las Vegas, Nevada and at the potential high-level repository site at Yucca Mountain. This compliance-based audit evaluated the BSC implementation of the following elements of the OCRWM QARD, DOE/RW-0333P, Revision 10: Design Control; Identification and Control of Items; Control of Special Processes; Inspection; Test Control; Control of Measuring and Test Equipment; Handling, Storage, and Shipping; Inspection, Test, and Operating Status, and Nonconformances.

Within the areas evaluated, the OR's directly observed the activities related to Design Control Processes, Identification and Control of Items, Control of Measuring and Test Equipment, Handling, Storage, and Shipping, and the disposition of Nonconformances. The audit team, through interviews of cognizant personnel, documentation reviews, and evaluation of procedures, assessed the adequacy and effectiveness of implementation of the Quality Assurance Program as well as verifying compliance with Yucca Mountain Project requirements. Additionally, the audit team reviewed the status of deficiency documents related to the areas of review to determine the effectiveness of completed corrective actions.

Current Status

The OR's evaluated the overall effectiveness of the OQA audit activities and the adequacy of implementation of QARD controls by the BSC, for the selected QARD sections. As a result of these activities the OR's concurred with the audit team's conclusions and findings. The OR's determined that OQA Audit BSC-ARC-01-06 was comprehensive, well planned and effectively implemented. The audit team members were independent of the activities they audited and they demonstrated a strong knowledge and understanding of the quality assurance program requirements and industry guidance. Within the areas evaluated, the OQA audit team identified one potential deficiency and one recommendation. The potential deficiency involved several examples of failure to comply with the requirements of Procedure AP-5.1Q, "Plan and Procedure Preparation, Review, and Approval", which prohibits the use of procedural "notes" to convey action requirements. The recommendation concerned the revision of ANL-WES-ME-000006, "Retrieval Equipment and Strategy for Waste Package on Pallet," to incorporate those portions of a superseded document necessary to provide a complete presentation of source material.

Overall, the audit team concluded that within the areas evaluated, the OCRWM QA program had been satisfactorily implemented by BSC. The OR's agreed that the observed audit areas were technically sound and that the QARD and applicable procedures were being effectively implemented with the exception of the potential deficiency that was identified.

During the exit meeting, the OR's stated that they agreed with the basis for the potential deficiency, related to the use of procedural notes to convey required actions, and the OR's encouraged DOE and the M&O to assess the procedures affected by this apparent nonconformance and to evaluate the impact and significance of the finding.

DEFICIENCIES DATA BASE

The OR reviewed the data base used for tracking and trending the deficiencies adverse to quality that have surfaced during the various audits, surveillances, self assessments, or observations. These deficiencies have been documented on Corrective Action Reports (CARs) or on Deficiency Reports (DRs). The OR review revealed that there appeared to be several indications of repetitive recurrences on deficiencies that were previously identified and closed. The subject matter for these deficiencies pertained to suppliers not including appropriate quality and technical requirements into procurement documents and deficiencies in developing scientific notebooks.

A number of deficiencies were noted in the area of procurement from the 1997-1999 time frame. From 2000, to the present, no significant deficiencies were noted, which indicates the procurement area is under control. However, from 2000 to the present time frame, there were six examples where suppliers failed to include applicable quality and technical requirements into supplier-generated procurement documents. This deficient quality condition was documented and initiated as NRC Open Item 99-1 in the August/September 1999, OR Report and ultimately closed in the September/October 2000, OR Report. The recent increase in procurement document deficiencies was discussed with the QA organization. The QA organization is presently evaluating this area for further potential trend investigation relative to suppliers fully understanding the incorporation of applicable quality and technical requirements into procurement documents.

There were several recurrences of various S/N deficiencies. Increased S/N deficiencies were noted as NRC OR Open Item 98-2 in the January-February 1998 NRC OR Report dated March 17, 1998. DOE initiated a custom training program for each participating organization in the use and control of S/Ns. Also, reviews of 656 ongoing or open S/Ns were conducted. Based on these results, the problems with S/Ns were corrected and NRC Open Item 98-2 was closed in the October-December 1999 OR Report. These efforts appeared to be effective. However, recently several recurrences of S/N deficiencies surfaced. A STIR was initiated by DOE on March 6, 2001, to determine whether sufficient actions are being taken by the affected organizations to correct recent conditions adverse to quality relative to implementation and use of S/Ns. This resulted in DOE Surveillance Report BSC-SR-01-014, concluding that BSC's management is proactive in the control of S/Ns and that no adverse quality trend exists nor did the review indicate a significant condition adverse to quality.

The OR agrees the S/N conditions that surfaced were mostly of a minor nature. However, there were about 15 recent separate findings and the OR does not conclude as the DOE, that a trend in S/N findings does not exist. This is of special concern in that DOE undertook a significant effort to correct and close the NRC OR Open Item in this area during the 1999 time-frame. The OR will monitor it through future DOE audits and surveillances to determine whether a trend exists.

BI-WEEKLY OPEN ITEMS MEETING

The OR attended the fourth bi-weekly open items and open issues meeting which is chaired by the BSC President and General Manager. The OR has an open invitation to attend these meetings. The purpose of these meetings are to expedite timely closure of open CARs, DRs, Nonconformance Reports (NCRs) and quality-related open items from the Condition/Issue Identification and Reporting/Resolution System. However, the subject matter at this particular meeting only deals with closure of BSC open items; not DOE open items. Many of the open item closure dates were recently re-evaluated and adjusted to allow closure dates to be more realistic. The BSC President and General Manager stressed that responsible individuals will be held accountable for timely closure on the agreed upon closure date. The OR will follow this activity and report on the progress in future OR Reports.

Presently, the DOE Corrective Action Board (CAB) charter is still in effect but there has not been any activity of the former CAB to meet and expedite closure of DOE open

items. Presently, the only DOE open items are two DR's that document deficiencies with the National Spent Fuel Program.

INSPECTOR GENERAL REPORT

At the request of U.S. Senator Harry Reid and former Secretary of Energy Bill Richardson, the DOE Office of the Inspector General (OIG) was requested to perform a review of whether the creation and circulation of certain documents reflected bias in the evaluation of the suitability of Yucca Mountain. The results of this review were documented in an April 23, 2001, report from Gregory Friedman to the DOE Secretary of Energy. The report concludes that the OIG investigation could not substantiate the initial concern that the integrity of the site evaluation was compromised as a result of certain documents being circulated.

Also, the report indicated (page 14) that there was no formal mechanism for tracking reviewer comments of the various versions of the draft Overview and that feedback was provided through one-on-one discussions, e-mail messages and telephone calls. According to this report, complete electronic mail records were unavailable to the OIG due to a computer malfunction. Since DOE has a formal computer backup tracking system whereby past electronic correspondence can be retrieved, the NRC requested and is awaiting further clarification from DOE pertaining to this matter.

DOE EMPLOYEE CONCERNS PROGRAM

As part of the transition to BSC, 1931 employees were interviewed by DOE Concerns Program personnel to determine whether they had any concerns in the areas of management, environmental safety and health, work environment issues, quality issues, or differing professional opinions. As a result, 180 concerns surfaced. DOE plans to hire an independent outside contractor to investigate whether employees believe they can openly and freely express concerns without fear of retaliation or reprisal. DOE will analyze the contractor findings and decide what course of action to take. The OR will follow this activity and report on progress in future OR reports.

5.0 EXPLORATORY STUDIES FACILITIES (ESF), AND NRC KEY TECHNICAL ISSUES

ENHANCED CHARACTERIZATION of the REPOSITORY BLOCK (ECRB)

DOE continues ECRB construction and testing activities to maximize the amount of data available to support DOE TSPA - Site Recommendation Rev.1. Enclosure 2 provides ESF and ECRB test locations. ECRB construction and testing activities are summarized below.

Background:

The excavation of the ECRB, completed on October 13, 1998, allows the collection of scientific and engineering data in stratigraphic units that constitute the bulk of the potential repository horizon.

Passive Hydrologic Test

Background:

Since June 1999, sections of the ECRB have been isolated from the rest of the underground facility by the construction of sealed bulkheads. These bulkheads are located at Stations 17+63, 25+03 and 26+00. No forced ventilation occurs beyond the bulkheads, except during brief entries to collect data and perform maintenance. This is a passive test designed to allow the isolated parts of the ECRB to return to ambient (pre-construction) moisture and temperature conditions to determine if dripping from the rock-mass can be observed. Hundreds of moisture monitoring probes are installed in tunnel walls at depths of up to 2 meters. While some test probes show evidence of rewetting, DOE scientists state that moisture conditions in this section of the ECRB have not fully re-equilibrated. DOE plans to continue this test through FY2001.

Current Status:

The September/October 2000 OR Report, initially suggested that DOE consider developing a detailed plan describing the test purpose and objective, approach, pre-test predictions, schedule and use of data collected. In the OR view, such a plan would provide greater confidence that test results would address data needs for DOE-NRC issue resolution activities. To date, this test plan has not been developed, however DOE states that the test plan is expected to be completed by August 2001. The OR will continue to monitor the development of this test plan.

Niche #5

Background:

This niche is constructed at Station 16+20 to conduct seepage testing in the Topopah Spring lower lithophysal zone. Over two-thirds of the potential repository is planned to be located in this rock unit. Niche walls and boreholes have been instrumented with moisture monitoring equipment. Test results will feed the unsaturated zone flow and transport process model report.

Current Status:

DOE scientists conducted liquid release testing from early March to early April 2001. Over this period, DOE scientists released approximately 300 liters of traced water from boreholes located about one meter above Niche 5 and detected no breakthrough of traced water in this niche.

In April 2001, DOE stopped water release testing to construct “batwings” or slots on each side of Niche 5. (See Enclosure 3) These batwings are designed to collect any seepage around the niche when liquid release testing resumes. This seepage testing is expected to continue through FY2001.

Systematic Hydrologic Characterization (SHC)

Background:

DOE scientists are conducting SHC testing to investigate the spatial variability of hydrologic properties affecting seepage processes. DOE plans to drill approximately 20 boreholes in the Topopah Spring lower lithophysal zone. These boreholes will be used for air permeability and liquid release/seepage measurements along with gas tracer measurements. Test results will feed the near-field and unsaturated zone flow and transport process model reports.

Current Status:

Over this period, DOE plans to continue to drill and conduct SHC testing in boreholes through FY2001.

In-Situ Thermal Conductivity Measurements

Background:

DOE's thermal properties data of the Topopah Spring lower lithophysal tuff unit is limited to a small number of laboratory measurements. Therefore, DOE plans to collect in-situ thermal conductivity measurements by drilling a series of paired 8.5 meter deep boreholes in this rock unit. Each pair of boreholes will contain a heater hole and an observation hole containing temperature sensors. The thermal pulse from the heater will allow the in-situ thermal conductivity of the rock to be calculated.

Current Status:

Over this period, DOE completed drilling the second of four sets of boreholes in the Topopah Spring lower lithophysal tuff. DOE plans to instrument these boreholes and start collecting thermal data over the next several months.

Alcove 8:

Background:

This alcove is constructed at Station 8+00 to conduct seepage testing from the Topopah Spring upper lithophysal zone to the underlying Topopah Spring middle nonlithophysal zone. DOE completed drilling a series of boreholes downward from this alcove for moisture monitoring. Niche #3, previously constructed in the Topopah Spring middle nonlithophysal zone, is situated directly below this alcove (approximately 20 meters) and will be used in this test. Infiltration systems constructed on the floor of Alcove 8 will apply traced water at a measured rate. Boreholes in Alcove 8 and Niche #3 will be used to monitor changes in moisture content and other properties of the rock-mass. DOE scientists plan on monitoring these boreholes using ground penetrating radar, neutron logging, and acoustic tomography. Test results will feed near field and unsaturated zone flow and transport process model reports.

Two infiltration plots have been constructed on the floor of this alcove. One plot measured approximately 1X1 meter, and the second plot approximately 3X4 meters. The 1X1 meter plot was constructed on a segment of a small fault exposed both on the floor of Alcove 8 and the roof of Niche 3. (See Enclosure 5) From August to December 2000, DOE scientists ponded water on this fault and monitored moisture conditions in Niche 3 to determine the breakthrough time of traced water, but no breakthrough occurred. According to DOE scientists, this fault is filled with gouge (clay like material) which may be inhibiting flow. DOE scientists report that subsequent analyses of this gouge material indicate the presence of smectite (clay that swells with water).

Current Status:

To enhance the infiltration and seepage processes along this fault, DOE scientists enlarged the infiltration plot. A trench (roughly 15 centimeters deep, 40 centimeters wide, and 4 meters long) was constructed along this fault. This trench allows water to pond over the entire length of the fault exposed in the floor of Alcove 8. On March 6, 2001, DOE started infiltration on this trench. On April 6th, DOE scientists detected initial breakthrough of traced water in Niche 3. According to DOE, the current infiltration rate is approximately 7.5 liters per hour, and the seepage rate in Niche 3 is roughly 10

percent of the infiltration rate. DOE scientists plan to start infiltration on the 3X4 meter plot in several months. This testing is expected to continue through FY2001.

EXPLORATORY STUDIES FACILITY (ESF) TESTING

DOE has completed moisture monitoring and testing in Alcoves 1, 2, 6, and Niches 1, 2. Limited moisture monitoring and seepage testing continues at Alcoves 3, 4, 7 and Niches 3 and 4. Ongoing ESF testing activities are summarized below.

CHLORINE-36 VALIDATION STUDY

Background:

DOE scientists are proceeding with a study to validate the presence of bomb-pulse chlorine-36 at two locations in the ESF. Approximately 60 samples have been collected in the vicinity of the Drill Hole Wash Fault and the Sundance Fault where elevated concentrations of chlorine-36 were detected in a previous study. These samples are being analyzed for chlorine-36, tritium, technetium-99, and supplemented by analyses of uranium, thorium, iodine-129 and radium isotopes.

To date, this validation study has detected no elevated chlorine-36 values; however, additional samples await analyses. According to DOE scientists, one possible explanation for the apparent disagreement between results of this study and an earlier study may lie in sample preparation and processing techniques. One of the two laboratories is thought to have used a more aggressive crushing technique which may release more rock chloride thus reducing the ratio of chlorine-36 to chlorine. To determine the effect of two different sample preparation and processing techniques, a bulk sample has been collected from the ECRB, crushed to a uniform size, and sample splits shipped to the two laboratories for analyses. According to DOE, the results of these analyses will be compared and the two laboratories will then agree to a standard sample processing method for subsequent chlorine-36 analyses. The two laboratories will synthesize their results and prepare a report documenting their findings including implications for conceptual models of unsaturated zone flow and transport. A final report on this study is expected to be completed before the end of CY2001.

Current Status:

The two laboratories completed separate leaching experiments of reference sample splits to determine what effect different leaching procedures have on the release of rock chloride and chlorine-36 analyses. According to DOE, preliminary results from leaching experiments suggest the following: 1) the manner in which chlorine is leached from rock impacts the ratio of chlorine-36 to chlorine; and 2) the cumulative ratio of chlorine-36 to chlorine decreases as leaching time increases. These results suggest that minimal sample treatment (e.g., passive leaching with short leaching time) yields higher ratios of chlorine-36 to chlorine. Based on these results, the DOE laboratories have tentatively agreed that the protocol for chlorine-36 analyses will use a 24-hour passive leach technique, and require that the Sample Management Facility crush all samples to a uniform size. The laboratories plan to complete chlorine-36 analyses on these samples, compare their results, and develop a standard protocol for analyzing the remaining chlorine-36 samples for this study.

Alcove 5 (Thermal Testing Facility Access/Observation Drift, Connecting Drift, and Heated Drift)

Background:

DOE initiated the heating phase of this test on December 3, 1997. The four-year heat-up phase will be followed by a four-year cool-down phase. Heat generated by nine electrical floor heaters and 50 electrical wing heaters simulate heat from emplaced waste. This test is designed to heat approximately 15,000 cubic meters of rock in the proposed repository horizon to 100° Centigrade (212° Fahrenheit) or greater to investigate coupled thermal-hydrologic-mechanical-chemical processes. These processes are monitored by approximately four thousand sensors positioned in 147 boreholes around the heated drift. A data collection system records measurements from these sensors.

Current Status:

DOE scientists continue to maintain drift wall-rock temperatures at or below 200° Centigrade (392° Fahrenheit). DOE plans to hold these wall-rock temperatures through CY2001 to evaluate the effect of sustained heating on the hydrologic, chemical and mechanical behavior of the rock and ground support. On April 26, 2001, sensors in the heated drift recorded the following preliminary temperatures: canister temperature of 196.7° Centigrade (386° Fahrenheit), rock-mass surface temperature of 195.6° Centigrade (384° Fahrenheit), and air temperature of 200.6° Centigrade (393° Fahrenheit).

DOE scientists continue moisture monitoring via geophysical logging of selected boreholes. DOE also monitors rock mass changes in and around the Heated Drift via borehole instrumentation and period observations of a remote operated camera. Over this reporting period, DOE scientists detected evidence of rock spalling in the crown of the Heated Drift and they are presently evaluating the nature of this condition. In April 2001, DOE issued Thermal Test Progress Report #6. The next DOE sponsored Thermal Test Workshop is scheduled for June 7 and 8 in Las Vegas.

Fluid Inclusion Study

Background:

University of Nevada Las Vegas (UNLV) scientists have completed a study to determine the origin and age of fluid inclusions found in secondary minerals (calcite and silica) at Yucca Mountain.

Current Status:

Over 150 samples from the ESF and ECRB have been collected and characterized to better understand the development of secondary minerals and spatial distribution of fluid inclusions. A final report, documenting the results of this study, is expected to be submitted to DOE by the end of May 2001.

Laser Strainmeter Test

Background:

Under a cooperative agreement with the Yucca Mountain Site Characterization Office, the University of California, San Diego will install and monitor a long-baseline strainmeter (LSM) in the ESF. The LSM experiment will supplement Global Positioning System surveys conducted at five sites in the Yucca Mountain area from 1991 to 1997, which indicated higher crustal elongation rates (strain rates) than those indicated by the volcanic and tectonic history of the region. The general test description consists of the installation and operation of the LSM along the South Ramp of the ESF. A laser will measure the distance between two end monuments.

Current Status:

DOE continues with the construction of strainmeter niche monuments. Over this period DOE instrumented four LSM boreholes in the South Ramp. The LSM is presently expected to begin operation by the Summer 2001 time frame.

SURFACE-BASED TESTING

Alluvial Tracer Complex (ATC)

Background:

The ATC is a joint Nye County and DOE Cooperative Program to investigate flow and transport properties of the saturated alluvium. Single-well ATC testing is being conducted at well NC-EWDP-19D/D1 (Enclosure 5) and includes both hydrologic and tracer testing. Cross-well hydrologic and tracer testing will also be performed at NC-EWDP-19D/D1 following the completion of single-well activities. Nye County drilled 19D/D1 to a depth of 1438 feet and encountered water at 366 feet and volcanic rocks at 810 feet. This well was completed to isolate six water bearing zones (4 in alluvium and 2 in volcanic rocks). Nye County instrumented wells NC-EWDP-4PA, 4PB, 19P, 15P and Washburn to determine affects of ATC hydrologic testing on surrounding wells.

Current Status:

On April 25, 2001, the third and final single-well tracer test was completed in NC-EWDP-19D/D1. This test was conducted in the uppermost screened alluvial interval (412-431 feet) in this well. The third tracer test was started in late January, followed by a 30 day shut-in period and a 60 day pumpback phase. In late January, the tracers (pentafluorobenzoic acid and sodium bromide) were injected followed by 22,000 gallons of chase water.

Waste Handling Building Geotechnical Investigation

Background:

DOE is conducting a geotechnical investigation at the Yucca Mountain North Portal area to collect data for the design of a waste handling building for a potential repository. This activity involves drilling a series of boreholes and excavating trenches/test pits to characterize this area.

Current Status:

Over this period, DOE continued the work of integrating geotechnical information collected from drilling and geophysical logging of 15 shallow boreholes. A final report is expected to be submitted to DOE by the end of FY 2001.

Busted Butte Unsaturated Zone Transport Test

Background:

The hydrologic and tracer testing at Busted Butte is designed to provide data to help model flow and transport of radionuclides in the unsaturated zone under the proposed repository. The Busted Butte underground facility includes a 72.5 meter main drift and a 19 meter test alcove. The test is being conducted in the base of the Topopah Spring non-to-partly-welded vitric sub-zones and the top of the Calico Hills Formation. Phase I tracer testing was completed in 1998. Phase II tracer testing was conducted in a separate 10X10X6 meter block of rock and this testing was completed in December 2000.

Current Status:

DOE continued post-test characterization of Phase II tracer testing. This work includes: overcoring selected injection boreholes, partial mine-back of the test block, and rock sampling and analyses to better characterize the distribution of reactive and nonreactive tracers. Over this period, DOE continued the partial mine-back and sampling of the Phase II block. This work is expected to be completed during the third quarter of FY2001. Atomic Energy of Canada, LTD., continues radionuclide transport testing on blocks of rock extracted from the Busted Butte Test Facility.

ENGINEERED BARRIER SYSTEM (EBS) TESTING

The Engineered Barrier System Operations Office of the Yucca Mountain Project continues to perform EBS testing. The EBS tests are performed in a Pilot Scale Test Facility located in North Las Vegas. Test results feed the EBS degradation and transport process model report.

PILOT SCALE TESTING**Pre-closure Ventilation Test*****Background:***

DOE's System Design Description for the emplacement drift system states that the subsurface ventilation will remove 70 percent of the heat generated by the waste packages during pre-closure. DOE is conducting a multi-phase pre-closure ventilation test in the EBS test facility. The objectives of this test are to (1) develop data to support the design of the ventilation system for the potential repository to maintain sub-boiling emplacement drift temperatures; and (2) provide data to support computer models used for ventilation calculations. This testing is expected to be completed by the end of FY2001.

Current Status:

Phase II of the EBS ventilation test, started in April 2001. Phase II testing is expected to start in March 2001. Phase II testing is expected to simulate the ability of the inlet air, at different temperatures, to maintain sub-boiling temperatures at the emplacement drift wall in a potential repository.

6.0 GENERAL**1.0 Appendix 7 Interactions**

- March 12, 2001, a member of the NRC Performance Assessment Section visited the Yucca Mountain Site. The purpose of this visit was to obtain an overview of the Exploratory Studies Facility and the Yucca Mountain Crest.
- March 22, 2001, eight members from the NRC Risk Task Group Section and the OR's visited the Yucca Mountain Site. The purpose of this visit was to obtain an overview of the Exploratory Studies Facility and Yucca Mountain Crest.

There were no outstanding issues raised as a result of either of these visits.

2.0 Other

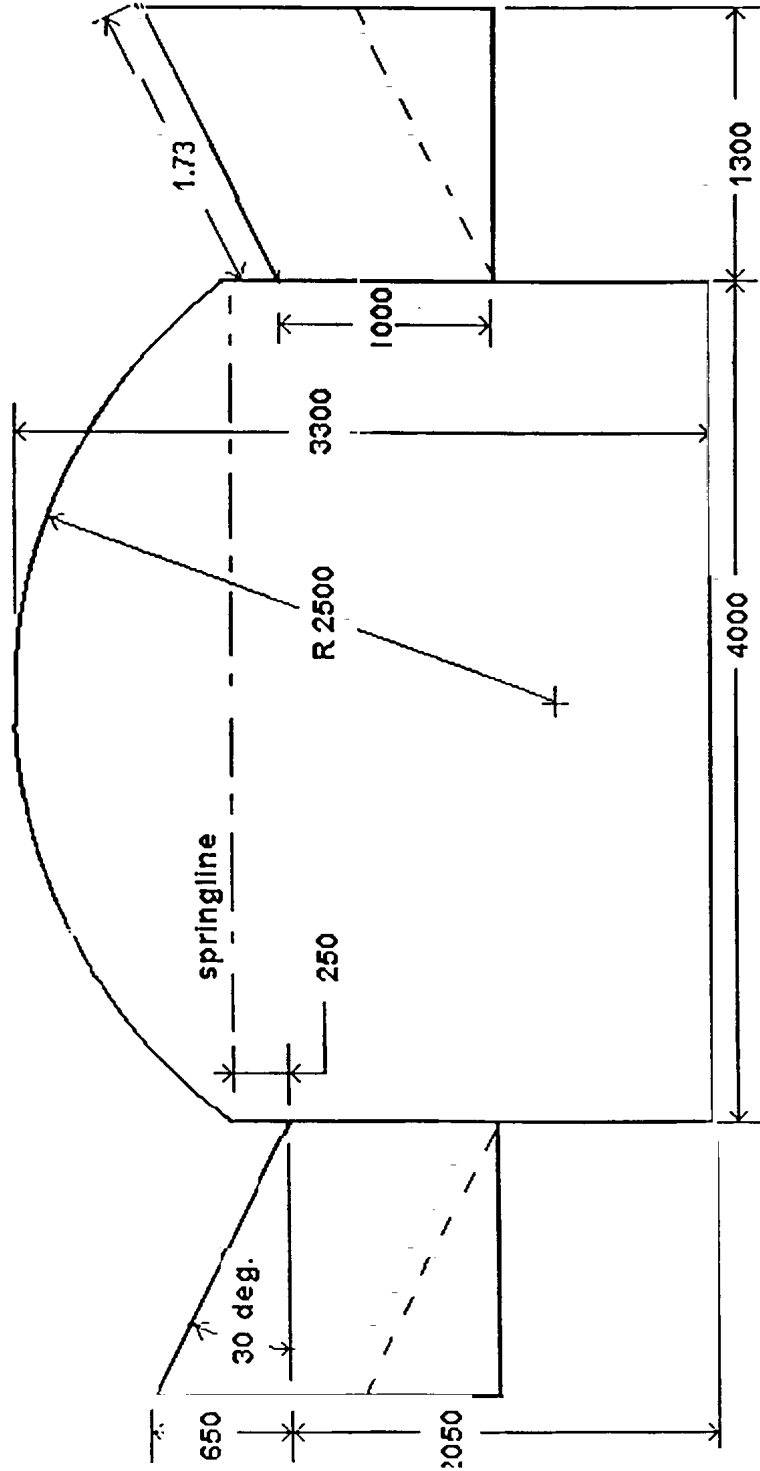
On March 28, 2001, NRC OR Office held a public meeting to provide information on the OR's role with regard to the potential high-level radioactive waste repository at Yucca Mountain.

On April 17 and 18, 2001, the OR's attended the NRC/DOE Quarterly QA/Management video conference meetings held in the NRC office in Rockville, Maryland, DOE offices in Las Vegas, NV, and Washington, DC, and Center for Nuclear Waste Regulatory Analyses in San Antonio, TX.

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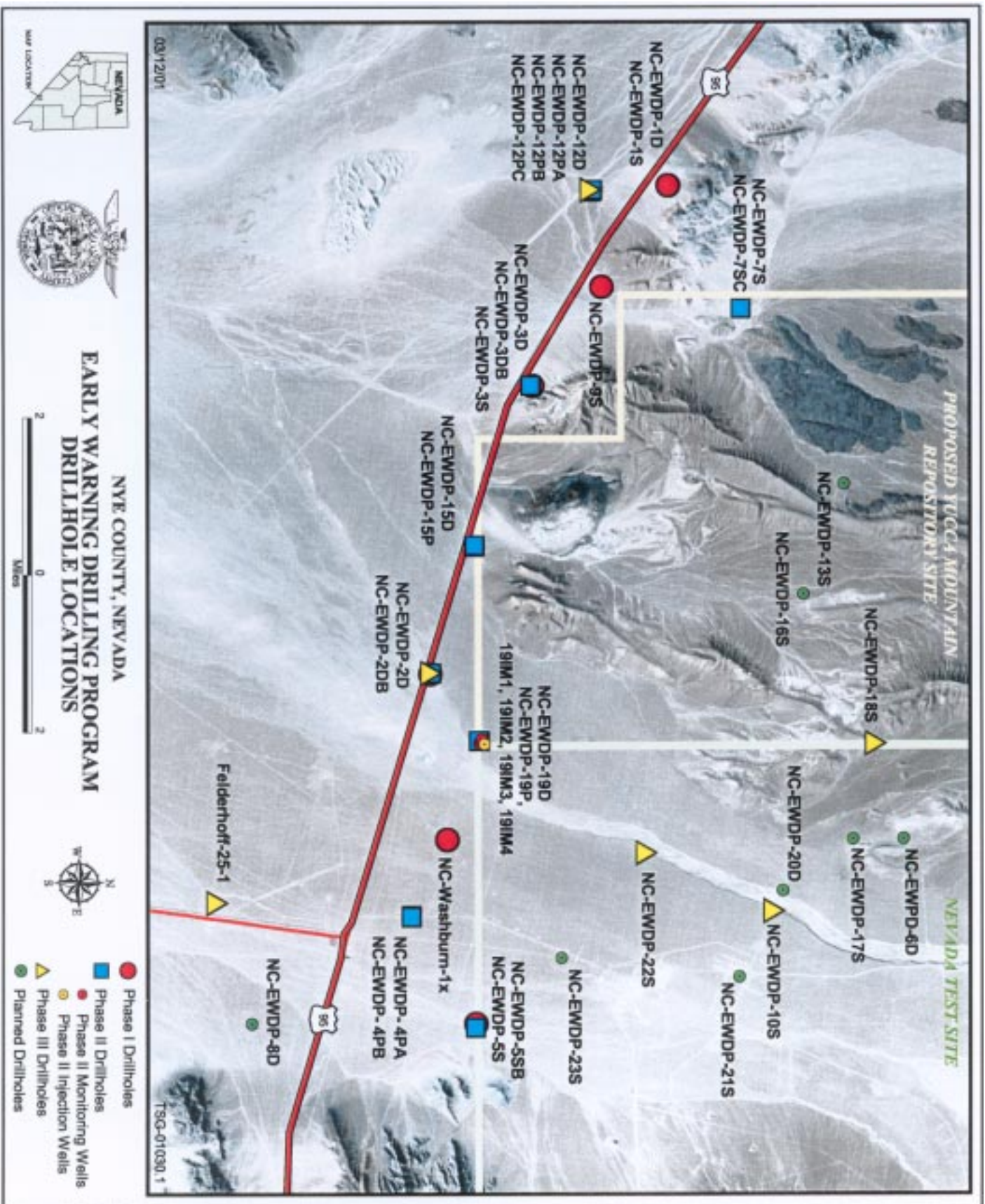
Niche 5 "Batwing" General Layout.



Niche 5 test excavation.

General Criteria:

- The angle of Batwings (slot) shall be approximately 30 degrees from horizontal upward (+/- 10 degrees).
 - The depth of Batwing (slot) excavation shall be 1.5 m.
 - The height of the Batwing (slot) shall be 1.0 m (+/- 300cm)
 - The bottom of the Batwing (slot) shall be horizontal to the invert.
 - Top of excavation at 250 mm below designed spring line.
 - Excavation will be accomplished by line drilling with subsequent use of currently approved expanding grout, with minimal hand spading.
- (NOTE: Dimensions are for illustration only, final dimensions will be shown on final design submittal drawing)



View looking South along Trench Cut with ponded water in Alcove 8



Enclosur

e 5